

CLAIMS

1. A method for transmitting a stream of audio data from an audio source to a receiver for decoding, said method comprising the steps of:

formatting the stream of audio data provided by the audio source into a sequence of audio data intervals;

transform encoding said sequence of audio data intervals to form a sequence of encoded audio data intervals, each said encoded audio data intervals having a plurality of transform coefficients;

analyzing said sequence of encoded audio data intervals to identify at least one encoded transient audio data interval, said encoded transient audio data interval including a short transient signal having first transient signal characteristics; and

embedding ancillary data into a said encoded audio data interval preceding said encoded transient audio data interval, said ancillary data providing notification that said encoded transient audio data interval includes said short transient signal.

2. A method as in claim 1 wherein said audio data intervals are formatted as pulse code modulation data.

3. A method as in claim 1 wherein said step of transform encoding comprises the step of applying a modified discrete cosine transform to said sequence of audio data intervals.

4. A method as in claim 1 wherein said step of transform encoding comprises the step of applying a shifted discrete Fourier transform to said sequence of audio data intervals.

5. A method as in claim 1 wherein said step of analyzing comprises the step of performing a frequency analysis on said transform coefficients to detect a short transient signal.

6. A method as in claim 5 wherein said step of performing a frequency analysis comprises the step of extracting a feature value from said transform coefficients.

7. A method as in claim 6 wherein said feature vector comprises a member of the group consisting of a primitive band energy value, an element-to-mean ratio of band energy, and a differential band energy value.

8. A method as in claim 5 wherein said step of performing a frequency analysis comprises the step of applying a shifted discrete Fourier transform.

9. A method as in claim 1 further comprising the steps of:
sending said encoded audio data interval having said ancillary information to the receiver; and
subsequently sending said encoded transient audio data interval to the receiver.

10. A method as in claim 1 wherein said short transient signal comprises a drumbeat.

11. A method as in claim 1 further comprising the step of analyzing said sequence of encoded audio data intervals to identify a second encoded transient audio data

interval, said second encoded transient audio data interval including a second short transient signal having second transient signal characteristics.

12. A method for decoding a sequence of transform-encoded audio data intervals to produce an audio sample, said method comprising the steps of:

inverse transform decoding the sequence of transform-encoded audio data intervals to yield a sequence of decoded audio data intervals having a plurality of transform coefficients;

retrieving ancillary data from said sequence of decoded audio data intervals, said ancillary data for identifying a said decoded audio data interval having a short transient signal as a transient decoded audio data interval;

identifying a defective decoded audio data interval in said sequence of decoded audio data intervals;

replacing said identified defective decoded audio data interval with one of said sequence of decoded audio data intervals not having a short transient signal to form a replacement decoded audio data interval if said identified defective audio data interval was not identified as said defective decoded audio data interval; and

replacing at least a portion of said identified defective decoded audio data interval with at least a portion of one of said sequence of decoded audio data intervals having a short transient signal form a replacement decoded transient audio data interval if said identified defective audio data interval was identified as a said defective decoded audio data interval.

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13. A method as in claim 12 wherein said defective decoded audio data interval comprises one of a corrupted decoded audio data interval and a missing decoded audio data interval.

14. A method as in claim 12 wherein said step of replacing said defective decoded audio data interval comprises the step of substituting a sequentially-previous decoded audio data interval for said defective decoded audio data interval.

15. A method as in claim 12 wherein said step of replacing said defective decoded audio data interval comprises the step of substituting a transient decoded audio data interval for said defective decoded audio data interval.

16. A method as in claim 12 wherein said step of replacing said defective decoded audio data interval comprises the step of substituting a composition audio data interval for said defective decoded audio data interval, said composition audio data interval including at least a portion of a previous decoded audio data interval and at least a portion of a transient decoded audio data interval.

17. A method as in claim 12 further comprising the steps of:
converting said decoded audio data intervals not identified as defective to formatted audio samples; and
converting said replacement audio data intervals to formatted audio samples.

18. A method as in claim 17 wherein said formatted audio samples are pulse code modulation formatted.

19. A method as in claim 12 wherein said step of replacing at least a portion of said identified defective decoded audio data interval comprises the step of matching the window type of said replacement decoded audio data interval with the window type of said identified defective decoded audio data interval.

20. A device for transmitting streaming audio information, said device comprising:

an encoder for formatting the audio information into a sequence of audio data intervals and for transform encoding said sequence of audio data intervals to form a sequence of coded audio data intervals; and

a transient detector for identifying at least one said coded audio data interval having a short transient signal as a transient coded audio data interval.

21. A device for concealing errors in a sequence of encoded audio data intervals, said device comprising:

a decoder for decoding said sequence of encoded audio data intervals to yield a sequence of decoded audio data intervals, said decoder also for identifying a defective said decoded audio data interval in said sequence of decoded audio data intervals, said decoder further for retrieving ancillary data from said sequence of decoded audio data intervals, said ancillary data for indicating which said decoded audio data interval includes a transient signal; and

an error concealment unit for replacing said defective decoded audio data interval with a non-defective decoded audio data interval including a transient signal if said defective decoded audio data interval originally included a transient signal.

22. A device as in claim 21 further comprising a buffer for storing said non-defective decoded audio data interval including a transient signal.

23. An error concealment system suitable for use in converting audio streaming information into an audio sample, said error concealment system comprising:

an audio source for providing the audio streaming information, said audio source including an encoder for converting the audio streaming information into a sequence of coded audio data intervals and a transient detector for classifying a coded audio data interval having a short transient signal as a transient coded audio data interval; and

a receiving terminal for converting said sequence of coded audio data intervals into the audio sample, said receiving terminal including an error concealment unit for replacing a defective said transient audio data interval with an error-free transient audio data interval.

24. An error concealment system as in claim 23 wherein said receiving terminal further comprises a decoder for decoding said sequence of coded audio data intervals.

25. An error concealment system as in claim 23 further comprising a telecommunications network connecting said receiving terminal with said audio source.

26. An error concealment system as in claim 25 wherein said telecommunications network comprises a wired network suitable for access by a telephone.

27. An error concealment system as in claim 23 wherein said telecommunications network comprises a member of the group consisting of a Global System for Mobile

Communications (GSM), a General Packet Radio Service (GPRS), a Wideband CDMA (WCDMA), a DECT, a wireless LAN (WLAN), and a Universal Mobile Telecommunications System (UMTS).

28. An error concealment system as in claim 23 wherein said audio source comprises a member of the group consisting of a server unit, a microphone, a personal digital assistant, and a mobile phone.

29. An error concealment system as in claim 23 wherein said receiving terminal comprises a member of the group consisting of a mobile phone, a personal digital assistant, and a computer.